

TRUTH  
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*Facts and Propositions*

F.P. RAMSEY

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T R U T H

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## ABOUT

In celebration of the 125th year of the *Proceedings* we are proud to announce our first ever *Online Conference of the Aristotelian Society*: a week-long event featuring a classic paper a day from our back catalogue, each accompanied by a commentary by a contemporary philosopher and an online forum open to all. The commentary will stimulate discussion by highlighting the paper's major themes and their continuing importance to current debates; signaling challenges to specific claims and arguments; and indicating thematic connections between the various papers.

Continuing in the Society's long tradition of publishing the proceedings of its live events, both the classic papers and commentaries will be published in our first ever *Proceedings of the Aristotelian Society, The Virtual Issue*, which will be free and available online following the conference.

The first Online Conference and Virtual Issue will focus on the theme of Truth. What is it for the things we say or believe to be true? Does truth depend on a relation between what we say or believe and the world? What are the natures of the things we say or believe, the bearers of truth? To what are the truth-bearers related when they are true: are they related to facts, ordinary objects, or something else? What is the required relation? We'll want an account of the nature of truth that addresses those questions also to fit with an account of truth's importance: why should it matter to us that what we say or believe is true rather than false? Our views about truth are liable to impact widely on our views about other things. Are moral claims or views apt to be true or false, or are they to be evaluated along different dimensions? Does truth figure in an account of the nature of belief or the nature of assertion? Is the acquisition of beliefs that are true amongst the fundamental aims of inquiry?

Each of the papers selected for the Online Conference were chosen for the distinctive answers that they advance to these questions. In some cases papers were chosen because they have had a decisive impact on later discussions, in others they were chosen because they present views and arguments that deserve more careful consideration than they have thus far received. In all cases, there is much to be gained from becoming acquainted, or reacquainted, with these important texts.

The Online Conference and Virtual Issue will be moderated and edited by Guy Longworth (Warwick).



## BIOGRAPHY

Frank Plumpton Ramsey (22 February 1903 – 19 January 1930) was a British mathematician who, in addition to mathematics, made significant contributions in philosophy and economics before his death at the age of 26. He was a close friend of Ludwig Wittgenstein, and was instrumental in translating Wittgenstein's *Tractatus Logico-Philosophicus* into English, and in persuading Wittgenstein to return to philosophy and Cambridge.

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## FACTS AND PROPOSITIONS

F.P. RAMSEY

THE problem with which I propose to deal is the logical analysis of what may be called by any of the terms judgment, belief, or assertion. Suppose I am at this moment judging that Caesar was murdered; then it is natural to distinguish in this fact on the one side either my mind, or my present mental state, or words or images in my mind, which we will call the mental factor or factors, and on the other side either Caesar or Caesar's murder, or Caesar and murder, or the proposition Caesar was murdered, or the fact that Caesar was murdered, which we will call the objective factor or factors, and to suppose that the fact that I am judging that Caesar was murdered consists in the holding of some relation or relations between these mental and objective factors. The questions that arise are in regard to the nature of the two sets of factors and of the relations between them, the fundamental distinction between these elements being hardly open to question.

Let us begin with the objective factor or factors; the simplest view is that there is one such factor only, a proposition, which may be either true or false, truth and falsity being unanalysable attributes. This was at one time the view of Mr. Russell, and in his essay, "On the Nature of Truth and Falsehood,"<sup>1</sup> he explains the reasons which led him to abandon it. These were, in brief, the incredibility of the existence of such objects as "that Caesar died in his bed," which could be described as objective falsehoods, and the mysterious nature of the difference, on this theory, between truth and falsehood. He therefore concluded, in my opinion rightly, that a judgment had no single object, but was a multiple relation of the mind or mental factors to many objects, those, namely, which we should ordinarily call constituents of the proposition judged.

There is, however, an alternative way of holding that a judgment has a single object, which it would be well to consider before we pass on. In the above-mentioned essay Mr. Russell asserts that a perception, which unlike judgment he regards as infallible, has a single object, for instance, the complex object "knife-to-left-of-book." This complex object can, I think, be identified with what many people (and Mr. Russell now)

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<sup>1</sup> In *Philosophical Essays*, 1910.

would call the *fact* that the knife is to the left of the book; we could, for instance, say that we perceived this fact. And just as, if we take any true proposition such as that Caesar did not die in his bed, we can form a corresponding phrase beginning with " the fact that " and talk about the fact that he did not die in his bed, so Mr. Russell supposed that to any true proposition there corresponded a complex object.

Mr. Russell, then, held that the object of a perception was a fact, but that in the case of judgment the possibility of error made such a view untenable, since the object of a judgment that Caesar died in his bed could not be the fact that he died in his bed, as there was no such fact. It is, however, evident that this difficulty about error could be removed by postulating for the case of judgment two different relations between the mental factors and the fact, one occurring in true judgments, the other in false. Thus, a judgment that Caesar was murdered and a judgment that Caesar was not murdered would have the same object, the fact that Caesar was murdered, but differ in respect of the relations between the mental factor and this object. Thus, in the *Analysis of Mind*<sup>2</sup>, Mr. Russell speaks of beliefs as either pointing towards or pointing away from facts. It seems to me, however, that any such view either of judgment or of perception would be inadequate for a reason, which, if valid, is of great importance. Let us for simplicity take the case of perception, and assuming for the sake of argument that it is infallible, consider whether "he perceives that the knife is to the left of the book" can really assert a dual relation between a person and a fact. Suppose that I who make the assertion cannot myself see the knife and book, that the knife is really to the right of the book; but that through some mistake I suppose that it is on the left and that he perceives it to be on the left, so that I assert falsely "he perceives that the knife is to the left of the book." Then my statement, though false, is significant, and has the same meaning as it would have if it were true; this meaning cannot therefore be that there is a dual relation between the person and something (a fact) of which "that the knife is to the left of the book" is the name, because there is no such thing. The situation is the same as that with descriptions; "the King of France is wise" is not nonsense, and so "the King of France," as Mr. Russell has shown, is not a name but an incomplete symbol, and the same must be true of "the King of Italy." So also "that the knife is to the left of the book," whether it is true or false, cannot be the name of a fact.

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<sup>2</sup> P. 272 – It should be observed that in the *Analysis of Mind*, a "belief " is what we call a mental factor, not the whole complex mental factors-relations-objective factors.

But, it will be asked, why should it not be a description of a fact? If I say, "he perceives that the knife is to the left of the book," I mean that he perceives a fact, which is not named but described as of a certain sort, and the difficulty will disappear when my assertion is analysed according to Mr. Russell's theory of descriptions. Similarly, it will be said, "the death of Caesar" is a description of an event, and "the fact that Caesar died" is only an alternative expression for "the death of Caesar."

Such an objection is plausible but not, in my opinion, valid. The truth is that a phrase like "the death of Caesar" can be used in two different ways; ordinarily, we use it as the description of an event, and we could say that "the death of Caesar" and "the murder of Caesar" were two different descriptions of the same event. But we can also use "the death of Caesar" in a context like "he was aware of the death of Caesar" meaning "he was aware that Caesar had died"; here (and this is the sort of case which occurs in the discussion of cognition) we cannot regard "the death of Caesar" as the description of an event; if it were, the whole proposition would be, "There is an event E of a certain sort, such that he is aware of E," and would be still true if we substituted another description of the same event, e.g., "the murder of Caesar." That is, if his awareness has for its object an event described by "the death of Caesar," then, if he is aware of the death of Caesar, he must also be aware of the murder of Caesar, for they are identical. But, in fact, he could quite well be aware that Caesar had died, without knowing that he had been murdered, so that his awareness must have for its object not merely an event but an event and a character also.

The connection between the event which was the death of Caesar and the fact that Caesar died is, in my opinion, this: "That Caesar died" is really an existential proposition, asserting the existence of an event of a certain sort, thus resembling "Italy has a King," which asserts the existence of a man of a certain sort. The event which is of that sort is called the death of Caesar and must no more be confused with the fact that Caesar died, than the King of Italy should be confused with the fact that Italy has a King.

We have seen, then, that a phrase beginning "the fact that" is not a name, and also not a description; it is, therefore, neither a name nor a description of any genuine constituent of a proposition, and so a proposition about "the fact that  $aRb$ " must be analysed into (1) the proposition  $aRb$ , (2) some further proposition about  $a$ ,  $R$ ,  $b$ , and other things; and an analysis of cognition in terms of relations to facts cannot

be accepted as ultimate. We are driven, therefore, to Mr. Russell's conclusion that a judgment<sup>3</sup> has not one object but many, to which the mental factor is multiply related; but to leave it at that, as he did, cannot be regarded as satisfactory. There is no reason to suppose the multiple relation simple, it may, for instance, result from the combination of dual relations between parts of the mental factor and the separate objects, and it is desirable that we should try to find out more about it, and how it varies when the form of proposition believed is varied. Similarly, a theory of descriptions which contented itself with observing that "the King of France is wise" could be regarded as asserting a possibly complex multiple relation between kingship, France, and wisdom, would be miserably inferior to Mr. Russell's theory, which explains exactly what relation it is.

But before we proceed further with the analysis of judgment, it is necessary to say something about truth and falsehood, in order to show that there is really no separate problem of truth but merely a linguistic muddle. Truth and falsity are ascribed primarily to propositions. The proposition to which they are ascribed may be either explicitly given or described. Suppose first that it is explicitly given; then it is evident that "it is true that Caesar was murdered" means no more than that Caesar was murdered, and "it is false that Caesar was murdered" means that Caesar was not murdered. They are phrases which we sometimes use for emphasis or for stylistic reasons, or to indicate the position occupied by the statement in our argument. So also we can say "it is a fact that he was murdered" or "that he was murdered is contrary to fact."

In the second case in which the proposition is described and not given explicitly, we have perhaps more of a problem, for we get statements from which we cannot in ordinary language eliminate the words "true" and "false." Thus if I say "he is always right" I mean that the propositions he asserts are always true, and there does not seem to be any way of expressing this without using the word "true." But suppose we put it thus "For all  $p$ , if he asserts  $p$ ,  $p$  is true," then we see that the propositional function  $p$  is true is simply the same as  $p$ , as *e.g.* its value "Caesar was murdered is true," is the same as "Caesar was murdered." We have in English to add "is true" to give the sentence a verb, forgetting that " $p$ " already contains a (variable) verb. This may perhaps be made clearer by supposing, for a moment, that only one form of proposition is in question, say the relational form  $aRb$ ; then "he is always right" could be expressed by "For all  $a, R, b$ , if he asserts  $aRb$ ,

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<sup>3</sup> And, in our view, any other form of knowledge or opinion that something is the case.

then  $aRb$ " to which "is true" would be an obviously superfluous addition. When all forms of proposition are included the analysis is more complicated but not essentially different, and it is clear that the problem is not as to the nature of truth and falsehood, but as to the nature of judgment or assertion, for what is difficult to analyse in the above formulation is "he asserts  $aRb$ ."

It is, perhaps, also immediately obvious that if we have analysed judgment we have solved the problem of truth; for taking the mental factor in a judgment (which is often itself called a judgment), the truth or falsity of this depends only on what proposition it is that is judged, and what we have to explain is the meaning of saying that the judgment is a judgment that  $a$  has  $R$  to  $b$ , *i.e.* is true if  $aRb$ , false if not. We can, if we like, say that it is true if there exists a corresponding fact that  $a$  has  $R$  to  $b$ , but this is essentially not an analysis but a periphrasis for "the fact that  $a$  has  $R$  to  $b$  exists" is no different from " $a$  has  $R$  to  $b$ ."

In order to proceed further, we must now consider the mental factors in a belief. Their nature will depend on the sense in which we are using the ambiguous term belief: it is, for instance, possible to say that a chicken believes a certain sort of caterpillar to be poisonous, and mean by that merely that it abstains from eating such caterpillars on account of unpleasant experiences connected with them. The mental factors in such a belief would be parts of the chicken's behaviour, which are somehow related to the objective factors, *viz.*, the kind of caterpillars and poisonousness. An exact analysis of this relation would be very difficult, but it might well be held that in regard to this kind of belief the pragmatist view was correct, *i.e.* that the relation between the chicken's behaviour and the objective factors was that the actions were such as to be useful if, and only if, the caterpillars were actually poisonous. Thus any actions for whose utility  $p$  is a necessary and sufficient condition might be called a belief that  $p$ , and so would be true if  $p$ , *i.e.* if they are useful.<sup>4</sup>

But without wishing to depreciate the importance of this kind of belief, it is not what I wish to discuss here. I prefer to deal with those beliefs which are expressed in words, or possibly images or other symbols, consciously asserted or denied; for these, in my view, are the most proper subject for logical criticism.

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<sup>4</sup> It is useful to believe  $aRb$  would mean It is useful to do things which are useful if, and only if,  $aRb$ ; which is evidently equivalent to  $aRb$ .

The mental factors of such a belief I take to be words, spoken aloud or to one's self or merely imagined, connected together and accompanied by a feeling or feelings of belief or disbelief, related to them in a way I do not propose to discuss.<sup>5</sup> I shall suppose for simplicity that the thinker with whom we are concerned uses a systematic language without irregularities and with an exact logical notation like that of *Principia Mathematica*. The primitive signs in such a language can be divided into names, logical constants, and variables. Let us begin with names; each name means an object, meaning being a dual relation between them. Evidently name, meaning, relation, and object may be really all complex, so that the fact that the name means the object is not ultimately of the dual relational form but far more complicated.<sup>6</sup> Nevertheless, just as in the study of chess, nothing is gained by discussing the atoms of which the chessmen are composed, so in the study of logic nothing is gained by entering into the ultimate analysis of names and the objects they signify. These form the elements of the thinker's beliefs, in terms of which the various logical relations of one belief to another can all be stated, and their internal constitution is immaterial.

By means of names alone the thinker can form what we may call atomic sentences, which from our formal standpoint offer no very serious problem. If  $a$ ,  $R$ , and  $b$  are things which are simple in relation to his language, *i.e.* of the types for instances of which he has names, he will believe that  $aRb$  by having names for  $a$ ,  $R$ , and  $b$  connected in his mind and accompanied by a feeling of belief. This statement is, however, too simple since the names must be united in a way appropriate to  $aRb$  rather than to  $bRa$ ; this can be explained by saying that the name of  $R$  is not the word "R," but the relation we make between " $a$ " and " $b$ " by writing " $aRb$ ." The sense in which this relation unites " $a$ " and " $b$ ," then determines whether it is a belief that  $aRb$  or that  $bRa$ . There are various other difficulties of the same sort, but I propose to pass on to the more interesting problems which arise when we consider more complicated beliefs, which require for their expression not only names but logical constants as well, so that we have to explain the mode of significance of such words as "not" and "or."

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<sup>5</sup> I speak throughout as if the differences between belief, disbelief, and mere consideration lay in the presence or absence of "feelings"; but any other word may be substituted for "feeling" which the reader prefers, *e.g.* "specific quality" or "act of assertion" and "act of denial."

<sup>6</sup> This is most obvious in the case of names, which generally consist of letters, so that their complexity is evident.

One possible explanation<sup>7</sup> is that they, or some of them, e.g. "not" and "and" in terms of which the others can be defined, are the names of relations, so that the sentences in which they occur are similar to atomic ones except that the relations they assert are logical instead of material. On this view every proposition is ultimately affirmative, asserting a simple relation between simple terms, or a simple quality of a simple term. Thus, "this is not-red" asserts a relation of negation between this and redness, and "this is not not-red" another relation of negation between this, redness and the first relation of negation.

This view requires such a different attitude to logic from mine that it is difficult for me to find a common basis from which to discuss it. There are, however, one or two things I should like to say in criticism – first, that I find it very unsatisfactory to be left with no explanation of formal logic: except that it is a collection of "necessary facts." The conclusion of a formal inference must, I feel, be in some sense contained in the premisses and not something new; I cannot believe that from one fact, e.g. that a thing is red, it should be possible to infer an infinite number of different facts, such as that it is not not-red, and that it is both red and not not-red. These, I should say, are simply the same fact expressed by other words; nor is it inevitable that there should be all these different ways of saying the same thing. We might, for instance, express negation not by inserting a word "not," but by writing what we negate upside down. Such a symbolism is only inconvenient because we are not trained to perceive complicated symmetry about a horizontal axis, and if we adopted it we should be rid of the redundant "not-not," for the result of negating the sentence "*p*" twice would be simply the sentence "*p*" itself.

It seems to me, therefore, that "not" cannot be a name (for if it were, "not-not-*p*" would have to be about the object not and so different in meaning from "*p*"), but must function in a radically different fashion. It follows that we must allow negations and disjunctions to be ultimately different from positive assertions and not merely the assertions of different but equally positive relationships. We must, therefore, abandon the idea that every proposition asserts a relation between terms, an idea that seems as difficult to discard as the older one that a proposition always asserted a predicate of a subject.

Suppose our thinker is considering a single atomic sentence, and that the progress of his meditation leads either to his believing it or his disbelieving it. These may be supposed to consist originally in two

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<sup>7</sup> See, especially, J. A. Chadwick, "Logical Constants," *Mind*, Jan., 1927.

different feelings related to the atomic sentence, and in such a relation mutually exclusive; the difference between assertion and denial thus consisting in a difference of feeling and not in the absence or presence of a word like "not." Such a word will, however, be almost indispensable for purposes of communication, belief in the atomic sentence being communicated by uttering it aloud, disbelief by uttering it together with the word "not." By a sort of association this word will become part of the internal language of our thinker, and instead of feeling disbelief towards " $p$ " he will sometimes feel belief towards " $\text{not-}p$ ."

If this happens we can say that disbelieving " $p$ " and believing " $\text{not-}p$ " are equivalent occurrences, but to determine what we mean by this "equivalent" is, to my mind, the central difficulty of the subject. The difficulty exists on any theory, but is particularly important on mine, which holds that the significance of "not" consists not in a meaning relation to an object, but in this equivalence between disbelieving " $p$ " and believing " $\text{not-}p$ ."

It seems to me that the equivalence between believing " $\text{not-}p$ " and disbelieving " $p$ " is to be defined in terms of causation, the two occurrences having in common many of their causes and many of their effects. There would be many occasions on which we should expect one or other to occur, but not know which, and whichever occurred we should expect the same kind of behaviour in consequence. To be equivalent, we may say, is to have in common certain causal properties, which I wish I could define more precisely. Clearly they are not at all simple; there is no uniform action which believing " $p$ " will always produce. It may lead to no action at all, except in particular circumstances, so that its causal properties will only express what effects result from it when certain other conditions are fulfilled. And, again, only certain sorts of causes and effects must be admitted; for instance, we are not concerned with the factors determining, and the results determined by, the rhythm of the words.

Feeling belief towards the words " $\text{not-}p$ " and feeling disbelief towards the words " $p$ " have then in common certain causal properties. I propose to express this fact by saying that the two occurrences express the same attitude, the attitude of disbelieving  $p$  or believing  $\text{not-}p$ . On the other hand, feeling belief towards " $p$ " has different causal properties and so expresses a different attitude, the attitude of believing  $p$ . It is evident that the importance of beliefs and disbeliefs lies not in their intrinsic nature but in their causal properties, *i.e.* their causes and more especially their effects. For why should I want to have a feeling of belief towards names " $a$ ," " $R$ ," and " $b$ " when  $aRb$ , and of disbelief when not-

$aRb$ , except because the effects of these feelings are more often satisfactory than those of the alternative ones.

If then I say about someone whose language I do not know "he is believing that not- $aRb$ ," I mean that there is occurring in his mind such a combination of a feeling and words as expresses the attitude of believing not- $aRb$ , *i.e.*, has certain causal properties, which can *in this simple case*<sup>8</sup> be specified as those belonging to the combination of a feeling of disbelief and names for  $a$ ,  $R$ , and  $b$ , or, in the case of one who uses the English language, to the combination of a feeling of belief, names for  $a$ ,  $R$ , and  $b$ , and an odd number of "not"'s. Besides this, we can say that the causal properties are connected with  $a$ ,  $R$ , and  $b$  in such a way that the only things which can have them must be composed of names for  $a$ ,  $R$ , and  $b$ . (This is the doctrine that the meaning of a sentence must result from the meaning of the words in it.)

When we are dealing with one atomic proposition only, we are accustomed to leave to the theory of probability the intermediate attitudes of partial belief, and consider only the extremes of full belief and full disbelief. But when our thinker is concerned with several atomic propositions at once, the matter is more complicated, for we have to deal not only with completely definite attitudes, such as believing  $p$  and disbelieving  $q$ , but also with relatively indefinite attitudes, such as believing that either  $p$  or  $q$  is true, but not knowing which. Any such attitude can, however, be defined in terms of the truth-possibilities of atomic propositions with which it agrees and disagrees. Thus, if we have  $n$  atomic propositions, with regard to their truth and falsity there are  $2^n$  mutually exclusive possibilities, and a possible attitude is given by taking any set of these and saying that it is one of this set which is in fact realised, not one of the remainder. Thus, to believe  $p$  or  $q$  is to express agreement with the possibilities  $p$  true and  $q$  true,  $p$  false and  $q$  true,  $p$  true and  $q$  false, and disagreement with the remaining possibility  $p$  false and  $q$  false. To say that feeling belief towards a sentence expresses such an attitude, is to say that it has certain causal properties which vary with the attitude, *i.e.* with which possibilities are knocked out and which, so to speak, are still left in. Very roughly the thinker will act in disregard of the possibilities rejected, but how to explain this accurately I do not know.

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<sup>8</sup> In the more complicated cases treated below a similar specification seems to me impossible, except by reference to a particular language. There are ways in which it can apparently be done, but, I think, they are illusory.

In any ordinary language such an attitude can be expressed by a feeling of belief towards a complicated sentence formed out of the atomic sentences by logical conjunctions; which attitude it is, depending not on the feeling but on the form of the sentence. We can therefore say elliptically that the sentence expresses the attitude, and that the meaning of a sentence is agreement and disagreement with such and such truth-possibilities, meaning by that that one who asserts or believes the sentence so agrees and disagrees.

In most logical notations the meaning of the sentence is determined by logical operation signs that occur in it, such as "not" and "and." These mean in the following way : "not- $P$ ," whether " $P$ " be atomic or not, expresses agreement with the possibilities with which " $P$ " expresses disagreement and vice versa. " $P$  and  $Q$ " expresses agreement with such possibilities, as both " $P$ " and " $Q$ " express agreement with, and disagreement with all others. By these rules the meaning of any sentence constructed from atomic sentences by means of "not" and "and" is completely determined; the meaning of "not" being thus a law determining the attitude expressed by "not- $P$ " in terms of that expressed by " $P$ ."

This could, of course, only be used as a *definition* of "not" in a symbolism based directly on the truth-possibilities. Thus in the notation explained on page 95 of Mr. Wittgenstein's *Tractatus Logico-Philosophicus*, we could define "not- $P$ " as the symbol obtained by interchanging the T's and blanks in the last column of " $P$ ." Ordinarily, however, we always use a different sort of symbolism in which "not" is a primitive sign which cannot be defined without circularity ; but even in this symbolism we can ask how "'nicht" means not' is to be analysed, and it is this question which the above remarks are intended to answer. In our ordinary symbolism the truth-possibilities are most conveniently expressed as conjunctions of atomic propositions and their negatives, and any proposition will be expressible as a disjunction of the truth-possibilities with which it agrees.

If we apply the logical operations to atomic sentences in an indiscriminate manner, we shall sometimes obtain composite sentences which express no attitude of belief. Thus " $p$  or not- $p$ " excludes no possibility and so expresses no attitude of belief at all. It should be regarded not as a significant sentence but a sort of degenerate case,<sup>9</sup> and is called by Mr. Wittgenstein a tautology. It can be added to any other

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<sup>9</sup> In the mathematical sense in which two lines or two points form a degenerate conic.

sentence without altering its meaning, for " $q: p$  or not- $p$ " agrees with just the same possibilities as " $q$ " The propositions of formal logic and pure mathematics are in this sense tautologies, and that is what is meant by calling them "necessary truths."

Similarly, " $p$  and not- $p$ " excludes every possibility and expresses no possible attitude: it is called a *contradiction*.

In terms of these ideas we can explain what is meant by logical, mathematical, or formal inference or implication. The inference from " $p$ " to " $q$ " is formally guaranteed when "if  $p$ , then  $q$ " is a tautology, or when the truth-possibilities with which " $p$ " agrees are contained among those with which " $q$ " agrees. When this happens, it is always possible to express " $p$ " in the form " $q$  and  $r$ ," so that the conclusion " $q$ " can be said to be already contained in the premiss.

Before passing on to the question of general propositions I must say something about an obvious difficulty. We supposed above that the meanings of the names in our thinker's language might be really complex, so that what was to him an atomic sentence might after translation into a more refined language appear as nothing of the sort. If this were so it might happen that some of the combinations of truth and falsity of his atomic propositions were really self-contradictory. This has actually been supposed to be the case with "blue" and "red," and Leibniz and Wittgenstein have regarded "this is both blue and red" as being really self-contradictory, the contradiction being concealed by defective analysis. Whatever may be thought of this hypothesis, it seems to me that formal logic is not concerned with it, but presupposes that all the truth-possibilities of atomic sentences are really possible, or at least treats them as being so. No one could say that the inference from "this is red" to "this is not blue" was formally guaranteed like the syllogism. If I may revert to the analogy of chess this assumption might perhaps be compared to the assumption that the chessmen are not so strongly magnetised as to render some positions on the board mechanically impossible, so that we need only consider the restrictions imposed by the rules of the game, and can disregard any others which might conceivably arise from the physical constitution of the men.

We have so far confined ourselves to atomic propositions and those derived from them by any finite number of truth-operations, and unless our account is to be hopelessly incomplete we must now say something about general propositions such as are expressed in English by means of the words "all" and "some," or in the notation of *Principia Mathematica* by apparent variables. About these I adopt the view of Mr.

Wittgenstein<sup>10</sup> that "for all  $x$ ,  $fx$ " is to be regarded as equivalent to the logical product of all the values of " $fx$ " *i.e.* to the combination  $fx_1$  and  $fx_2$  and  $fx_3$  and . . . , and that "there is an  $x$  such that  $fx$ " is similarly their logical sum. In connection with such symbols we can distinguish first the element of generality, which comes in in specifying the truth-arguments, which are not, as before, enumerated, but determined as all values of a certain propositional function; and, secondly, the truth-function element which is the logical product in the first case and the logical sum in the second.

What is novel about general propositions is simply the specification of the truth-arguments by a propositional function instead of by enumeration. Thus general propositions, just like molecular ones, express agreement and disagreement with the truth-possibilities of atomic propositions, but they do this in a different and more complicated way. Feeling belief towards "for all  $x$ ,  $fx$ " has certain causal properties which we call its expressing agreement only with the possibility that all the values of  $fx$  are true. For a symbol to have these causal properties it is not necessary, as it was before, for it to contain names for all the objects involved combined into the appropriate atomic sentences, but by a peculiar law of psychology it is sufficient for it to be constructed in the above way by means of a propositional function.

As before, this must not be regarded as an attempt to define "all" and "some," but only as a contribution to the analysis of "*I believe that all (or some).*"

This view of general propositions has the great advantage that it enables us to extend to them Mr. Wittgenstein's account of logical inference, and his view that formal logic consists of tautologies. It is also the only view which explains how " $fa$ " can be inferred from "for all  $x$ ,  $fx$ ," and "there is an  $x$  such that  $fx$ " from  $fa$ . The alternative theory that "there is an  $x$  such that  $fx$ " should be regarded as an atomic proposition of the form " $F(f)$ " ( $f$  has application) leaves this entirely obscure; it gives no intelligible connection between  $a$  being red and red having application, but abandoning any hope of explaining this relation is content merely to label it "necessary."

Nevertheless, I anticipate that objection will be made on the following lines: firstly, it will be said that  $a$  cannot enter into the meaning of "for all  $x$ ,  $fx$ ," because I can assert this without ever having heard of  $a$ . To this I answer that this is an essential part of the utility of

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<sup>10</sup> And also, apparently, of Mr. Johnson. See his *Logic*, Part II, p. 59.

the symbolism of generality, that it enables us to make assertions about things we have never heard of and so have no names for. Besides, that  $a$  is involved in the meaning of "for all  $x$ ,  $fx$ " can be seen from the fact that if I say "for all  $x$ ,  $fx$ ," and someone replies "not- $fa$ ," then even though I had not before heard of  $a$ , he would undoubtedly be contradicting me.

The second objection that will be made is more serious; it will be said that this view of general propositions makes what things there are in the world not, as it really is, a contingent fact, but something presupposed by logic or at best a proposition of logic. Thus it will be urged that even if I could have a list of everything in the world " $a$ ," " $b$ ," ... " $z$ ," "for all  $x$ ,  $fx$ " would still not be equivalent to " $fa$ ,  $fb$ ...  $fz$ ," but rather to " $fa$ ,  $fb$ ...  $fz$  and  $a$ ,  $b$ ...  $z$  are everything." To this Mr. Wittgenstein would reply that " $a$ ,  $b$ ...  $z$  are everything" is nonsense, and could not be written at all in his improved symbolism for identity. A proper discussion of this answer would involve the whole of his philosophy, and is, therefore, out of the question here; all that I propose to do is to retort with a *tu quoque!* The objection would evidently have no force if " $a$ ,  $b$ ...  $z$  are everything" were, as with suitable definitions I think it can be made to be, a tautology; for then it could be left out without altering the meaning. The objectors will therefore claim that it is not a tautology, or in their terminology not a necessary proposition; and this they will presumably hold with regard to any proposition of the sort, *i.e.* they will say that to assert of a set of things that they are or are not everything cannot be either necessarily true or necessarily false. But they will, I conceive, admit that numerical identity and difference are necessary relations, that "there is an  $x$  such that  $fx$ " necessarily follows from " $fa$ ," and that whatever follows necessarily from a necessary truth is itself necessary. If so, their position cannot be maintained; for suppose  $a$ ,  $b$ ,  $c$  are, in fact, not everything, but that there is another thing  $d$ . Then that  $d$  is not identical with  $a$ ,  $b$ , or  $c$  is a necessary fact; therefore it is necessary that there is an  $x$ , such that  $x$  is not identical with  $a$ ,  $b$ , or  $c$ , or that  $a$ ,  $b$ ,  $c$  are not the only things in the world. This is, therefore, even on the objector's view, a necessary and not a contingent truth.

In conclusion, I must emphasise my indebtedness to Mr. Wittgenstein, from whom my view of logic is derived. Everything that I have said is due to him, except the parts which have a pragmatist tendency,<sup>11</sup> which seem to me to be needed in order to fill up a gap in his

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<sup>11</sup> And the suggestion that the notion of an atomic proposition may be relative to a language.

system. But whatever may be thought of these additions of mine, and however this gap should be filled in, his conception of formal logic seems to me indubitably an enormous advance on that of any previous thinker.

My pragmatism is derived from Mr. Russell; and is, of course, very vague and undeveloped. The essence of pragmatism I take to be this, that the meaning of a sentence is to be defined by reference to the actions to which asserting it would lead, or, more vaguely still, by its possible causes and effects. Of this I feel certain, but of nothing more definite.



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